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THE
TRAINING SCHOOL BULLETIN

OCTOBER, 1949

MENTAL SUBNORMALITY DEVELOPMENTALLY ARRESTED: THE PRIMARY MENTAL ABILITIES TEST

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For over thirty years the mentally deficient have been classified by the Binet method. The Binet MA or IQ was believed to measure the general mental level of the feebleminded and at one time, three years retardation in Binet MA was considered to be indicative of a diagnosis of mental deficiency. Although Doll (2, 3, 4) has emphasized social incompetance as the first condition necessary for a diagnosis of mental deficiency, he contends that *the social incompetence must be due to mental subnormality which has been developmentally arrested.* Doll's criteria, then, do not obviate the necessity for evaluating the intellectual level of the subject. Although Doll (6) and others have warned against the use of any single psychometric score to evidence mental subnormality, the use of the Binet for this purpose seems to predominate.

Clinicians and educators have frequently recognized a marked qualitative difference in the behaviour of mentally deficient children who have the same Binet MA. The recent evidence that the etiology of mental deficiency has crtain behaviour correlates, e. g., 5, 8, 10, and the consequent focus of attention upon etiological differences, has led to observations which cause some workers in the field to question the adequacy of the Binet MA as a classificatory device for the mentally deficient. This inadequacy seems to be especially evident in the case of exogenous, brain injured children.

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This study deals with an attempt to see if the MA's obtained on the SRA Primary Mental Abilities Test (ages 5 to 7) of Thurstone (9) present a more adequate, and therefore more revealing picture than the Binet MA of the general functional level of endogenous and exogenous mentally deficient children. If the profiles of the primary mental abilities, which the test purports to measure, of the two etiological groups differ significantly, then our results should have immediate value to all those such as clinicians, educators, and administrators who deal with the classification and education of the mentally deficient.

Before describing the psychometric instrument used, some clarification of the etiological classification is in order. By the *endogenous* mentally deficient child we mean those persons who are feebleminded due to heredity—transmission in kind. We believe that the *endogenous* child is mentally subnormal in the sense that all of his mental processes are at about the same level at any given stage of maturation, although developmentally retarded in comparison with the normal. At maturity the mental processes of the *endogenous* individual will not have reached the level of development of the normal, and this is especially evident in the area of usage of abstract language symbolism.

By the *exogenous* mentally deficient child we mean those whose mental deficiency is not due to heredity but to some other cause, e. g., trauma, illness, glandular dysfunction. We believe that the *exogenous* feebleminded child shows specific deficits in his mental processes with irregularities in development at the various maturational stages, with probably defective integration among the mental processes.[1]

As an instrument likely to reveal the general functional level of endogenous and exogenous mentally deficient children, the present writers elected to use the SRA Primary Mental Abilities Test, Ages 5 to 7 (9). From this test six separate scores, each convertible to mental ages are obtained: those of the five primary mental abilities (sic), viz., (1) Verbal Meaning (V)—the ability to understand ideas expressed as words; (2) Perceptual Speed (P)—the ability to recognize likenesses and differences between objects or symbols quickly and accurately; (3) Motor (Mo)—the ability to coordinate hand and eye movements; (4) Space (S)—the ability to visualize and to think about

1. It must be kept in mind that whereas the endogenous group would appear to be homogeneous with regard to etiology, "exogenous" is a classificatory term covering many different causes which occur at different maturational stages. Consequently it is logical to expect the exogenous to be heterogeneous with regard to behaviour characteristics.

objects in two or three dimensions; (5) Quantitative (Q)—the ability to understand the meaning of small numbers and their order as well as to discriminate size differences in objects; and (6) a total mental age. Such a test as this lends itself to a pattern analysis of the sub-test scores. Moreover, this is not mere sub-test analysis because of the theoretical implication that we be dealing with what Professor Thurstone considers the primary mental abilities.

Immediately apparent, however, are several disadvantages to the use of this test. The range is limited: the test was standardized on children of LA's from 5 to 7 years and although the norms go from MA 3.0 to 9.0, those MA's outside the 5.0—7.0 range are based upon extrapolation and therefore are not necessarily correct. Second, few normative data have been published. Hence we are necessarily ignorant of such things as the size of N at each age level, the variability, the standard errors of the inter-test correlation coefficients, and possible sex differences. Third, the derivation of the total MA is not clear. Although it is obtained by summing the raw scores of V, P, Q, and S, certain total MA's obtained this way are difficult to understand. For instance, a subject whose raw score on each sub-test is equivalent to an MA of 5.0 per sub-test, would have a total MA of but 4.8. Obviously, however, we feel that the advantages of this test sufficiently outweigh the disadvantages to justify its use for our purposes.

The population for this study was selected on the basis of a threefold criterion. First, only those children in The Training School population who were diagnosed as mentally deficient or potentially so were considered. Second, only those children for whom the etiological diagnosis was determined by the clinical psychologist to be reasonably clear were considered. The basis for the judgment was anamnesis and psychological clinical evaluation. In the exogenous group all morphological clinical types as well as the cerebral palsies, known endocrine dysfunctions, and epileptics were excluded. Third, the maximum LA was set at 19.9. This tended to weight the population with children who were still in the process of growth.

All of the children who met these three criteria were given the PMA test. It was administered in groups of twelve subjects each, with one of the writers reading the instructions and the other acting as a proctor.[2] It is believed that the test performances were not adversely

2. The writers are indebted to Mrs. A. M. Nash, Director of Education, The Training School, for supervising the attendance of these groups

affected by the size of the groups. After eliminating the children whose PMA total MA's were not within the range of the test, i. e., those who scored outside the 3.5 to 9.0 range, the resultant population consisted of 37 endogenous and 38 exogenous subjects.

In Table 1 are presented the N, LA and sex data for this population.

TABLE 1. PMA Population Characteristics

	N	Male	Female	Life Age	
				Mean	SD
Endogenous	37	32	5	14.1	2.8
Exogenous	38	24	14	14.0	2.8

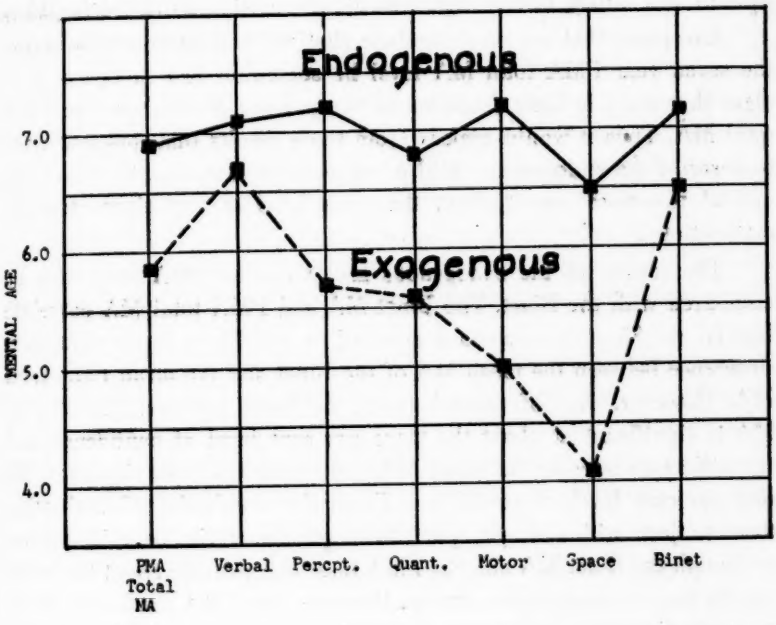
One endogenous boy, due to a recent unfortunate accident, had but two fingers on his right hand. Since he appeared to be right handed, we felt justified in discarding his results on the Motor test. Hence in any statistical treatments involving Motor MA, the endogenous N is 36.

In Table 2 are presented the PMA test results and the 1916 Stanford-Binet scores of the two etiological groups in terms of group means and standard deviations. To facilitate a general, overall view of the group results the mean scores per etiological group are presented graphically in Chart 1.

TABLE 2. PMA Population Test Results

	Endogenous		Exogenous	
	Mean	SD	Mean	SD
Total PMA MA	6.9	1.4	5.8	1.4
Verbal MA	7.1	1.3	6.7	1.3
Perceptual MA	7.2	1.7	5.7	1.9
Quantitative MA	6.8	1.9	5.6	1.9
Space MA	6.5	1.6	4.1	2.8
Motor MA	7.2	1.4	5.0	2.4
1916 Binet MA	7.2	1.5	6.5	1.3

CHART 1. Mean Scores Per Test by Etiological Group



We shall consider first the endogenous group results. It is notable that the mean scores in all of the tests listed in Table 2 are at about the same general level. They go from 6.5 to 7.2 years in mental age, a range of but 0.7 years. We believe this range to be exceedingly small. The only mean score which differs significantly from the PMA total MA mean is that of Space MA and that difference is reliable at about the three per cent level of confidence.[3] The difference in means between the Space MA and Verbal MA is significant at the five per cent level of confidence, between Space MA and Perceptual MA at better than the one per cent level, and between Space MA and Motor MA at about the two per cent level of confidence. The Space MA is the only sub-test MA which differs significantly from the other sub-test MA's.

Excepting that we may conclude that the endogenous subjects of the seven year PMA total MA level be somewhat low in Space, it is clear that there is little deviation of the sub-test MA's from the PMA total MA. Thus it would appear from these results that this test tends to describe the endogenous child as we observe him, viz., " . . . all his mental processes are at about the same level at any given stage of maturation . . . "

The results of the endogenous group on the PMA must also be compared with the Binet. The Binet MA and PMA total MA correlate highly, + .85 with a standard error of ± .04. There is no significant difference between the mean MA of the Binet and the mean PMA total MA. However, the difference between the Binet MA and Quantitative MA is significant at about the three per cent level of confidence and the difference between the Binet MA and Space MA is significant at the one per cent level of confidence. From the standpoint of evaluating these subjects with a single, quantitative psychometric score, it appears as though the Binet MA and the PMA total MA provide about the same results for this endogenous group. However, the PMA profile might be of more diagnostic value than a quantitative analysis of Binet results even though we do not yet know all of the practical implications of the PMA subtest scores.

We shall now consider the results of the exogenous group on the PMA. From the over view afforded by Chart 1 it is apparent that there is a large amount of variation between the sub-test means. Referring to Table 2 we see that the MA's go from 4.1 to 6.7 years with a range

3. Correcting for correlation and using Student's t distribution.

of 2.7 years. We believe this range to be fairly large. The differences between PMA total MA and both Verbal MA and Space MA are significant at better than the one per cent level of confidence, and the difference between PMA total MA and Motor MA is significant at the five per cent level of confidence. These data indicate that exogenous children of about the 5.5 to 6.0 year PMA total MA level, in terms of their total MA, tend to be high in Verbal MA, low in Space MA and Motor MA, and at about the same level in Perceptual Speed MA and Quantitative MA. Reconsidering our observations concerning the exogenous child, viz., " . . . specific deficits in his mental processes with distortions in development . . . ", it would seem as though Space MA and probably Motor MA, as evidenced on the PMA represent some of the specific deficits.

The exogenous PMA performance in relation to Binet score is quite different from that of the endogenous. With the exception of verbal MA, the differences between all of the sub-test scores, including the PMA total MA, and the Binet MA are significant at better than the one per cent level of confidence. The PMA total MA and Binet MA correlate + .79, ± .06; but the Verbal MA and Binet MA correlate + .85, ± .05. It would appear from these data that the Binet MA and only the Verbal MA tend to make the same estimate of these exogenous children.

There is a further point to consider regarding the performance of these two etiological groups on the PMA test, and that is variability. If our descriptions be correct, it would be expected that the exogenous group should show more variability than the endogenous. Although the fundamental evidence on variation is shown by the stan-

TABLE 3. PMA Population Coefficients of Variation*

	Endogenous	Exogenous
Total PMA MA	20.3	24.2
Verbal MA	18.3	19.4
Perceptual MA	23.6	33.4
Quantitative MA	28.0	34.0
Space MA	24.6	68.3
Motor MA	19.4	48.0
1916 Binet MA	20.8	20.0

*V is determined by the formula $\frac{(100)\ (SD)}{\bar{x}}$

dard deviations in Table 2, the variability of the two groups is better compared by the coefficients of variation for the two etiological groups. With the exception of the Binet MA and the Verbal MA, it is quite clear that the exogenous group presents the more variability. Since these results confirm expectations, these findings appear to be further evidence suggesting the value of the PMA in describing endogenous and exogenous feebleminded children.

This study provides a basis for explaining some previous findings on etiological differences. A frequent method used by researchers in dealing with etiology and its behavioural correlates has been to equate, in terms of Binet MA, a group of endogenous subjects with a group of exogenous subjects and then find the significance of the difference in performance on some task. A reexamination of Table 2 shows that the mean Binet MA's of the present etiological groups are only 0.7 years apart, but the mean Space MA's differ by 2.4 years. In view of this, it is no wonder that Hoakley and Frazeur (7), for instance, found their exogenous group to be inferior to their endogenous group in drawing the Binet designs or that Cassel (1) found the exogenous to present a marked inferiority to the endogenous in the task of drawing designs when in both experiments the two etiological groups were equated for Binet MA. The results of both experiments could have been predicted on the basis of PMA results but could not be foreseen in terms of the Binet MA.[4] In this instance the special deficit of the exogenous was not represented by the single, quantitative, overall psychometric score, i. e., the Binet MA.

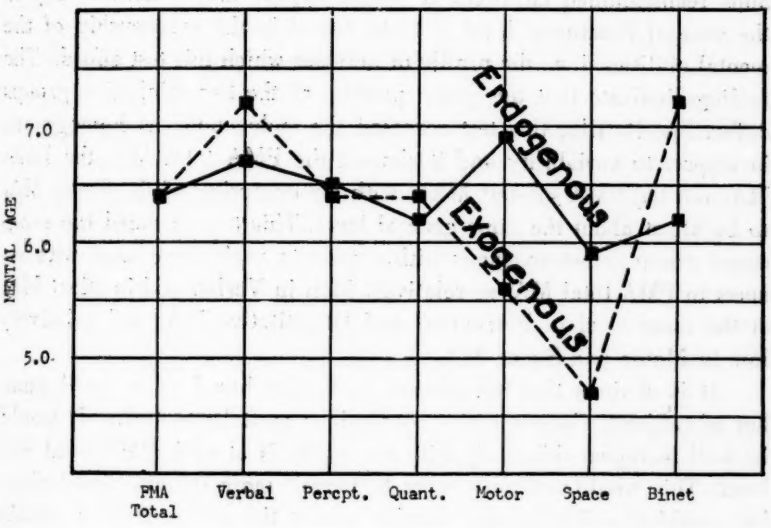
It is unfortunate that these two etiological groups are not equated in PMA total MA, for on the basis of the present data it may only be assumed that were the endogenous group lower grade or the exogenous group higher grade, the group patterns would remain identical with our findings. In an effort to obviate this difficulty, the writers tried to formulate a group of matched pairs. An endogenous subject was matched with an exogenous subject whose PMA total MA was within 0.1 years. We were able to equate 22 pairs.

The mean test scores per etiological group are presented graphically in Chart 2. It is evident that although this endogenous group tends to be relatively high in Motor MA and somewhat low in Space

4. That the results might have been predicted by a *qualitative* analysis of Binet performance is not relevant here.

CHART 2.

Mean Scores Per Test by Etiological Groups: Equated Population



MA, it seems to present a general level of abilities. This is essentially similar to the findings with the total endogenous group as presented in Chart 1. The curve of the matched exogenous group compares favourably with the curve of the total exogenous group as seen in Chart 1. We may new tentatively conclude that some lowering of the endogenous PMA total MA and some raising of the exogenous PMA total MA level does not seem to change the general pattern for either group on the PMA test.

SUMMARY

This study dealt with an attempt to determine if the results obtained with the PMA test of Thurstone are more revealing than the Binet MA of the general functional level of endogenous and exogenous feebleminded children. It would appear that a definite key to the general functional level is to be found in the relationship of the mental abilities, i. e., the profile of abilities which this test affords. The findings indicate that the group profiles of the two etiological groups differ. Specifically, this test revealed the endogenous as homogenous in respect to variability and it showed the PMA total MA, the Binet MA, and the PMA sub-test MA's, with the exception of the Space MA, to be all at about the same general level. This test revealed the exogenous group as heterogenous with respect to variability, and, with respect to PMA total MA, as relatively high in Verbal and in Binet MA, at the same level in Perceptual and Quantitative MA, and relatively low in Motor and Space MA.

It is obvious that the present study was based on a small number of subjects. Consequently, conclusions must be tentative. It would be well to repeat this study with a sizeable N at each PMA total MA level. This would not only serve to permit more definite conclusions but would also demonstrate whether or not the group profiles remain constant throughout the various MA levels. It would also be of value to do this same kind of study with the next higher level PMA test, viz., life ages (mental ages) 7 to 11, to see if these or other patterns obtain. Although not apparent in the normative data, it is also possible that sex might be a variable on this test. The practical and clinical significance of these results are yet to be determined. It would be most valuable to know if the PMA profile is a valid indicator of the educational training program which the child requires, and the worth of this profile as an indicator of clinical prognosis for the child.

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ABSTRACTS OF PUBLICATIONS OF THE RESEARCH DEPARTMENT THE TRAINING SCHOOL AT VINELAND

DOLL, EDGAR A., CLASSIFICATION OF OFFENDERS. Appearing in the *Encyclopedia of Criminology*. Branham, V. C. and Kutash, S. B. (editors) New York: Philosophical Library. 1949, 67-69.

A very brief history of penal classification before 1920 is given. The author dates the development of modern classification procedures from the report of the New Jersey Prison Inquiry Commission in 1917. The history of the development of the classification system in New Jersey with the contributions of B. G. Lewis, C. Derrick, E. A. Doll, and others is described in some detail. It is stated that in general, most current classification systems are patterned after the New Jersey plan. The present plan coordinates all agencies for the welfare of the offender, simplifies institutional administration, affords maximal protection to society, and cares for offenders in a constructive manner. The future of classification seems promising for: (1) competent younger personnel are interested in the field; (2) the system is the product of vision and imagination; (3) it affords means for continued scientific progress; (4) it is oriented towards systematic study of the individual offender which presents the principal clues to the prevention of crime. Five references.

R. H. CASSEL

DOLL, EDGAR A., MATURATION. Appearing in the *Encyclopedia of Criminology*. Branham, V. C. and Kutash, S. B. (editors) New York: Philosophical Library. 1949, 221-223.

A major problem in the history of jurisprudence has been the concept of personal responsibility. Therefore, there has long been interest in mental and social maturation and competence. Advances in one phase of applied psychology have made possible the evaluation of mental maturation through the use of such instruments as the Binet scale. The evaluation of social maturation has recently become practical through the use of The Vineland Social Maturity Scale. This scale is described and its theory, general use, therapeutic use, and possible value in support of pleas in mitigation are discussed.

R. H. CASSEL

DOLL, EDGAR A., MENTAL DEFICIENCY. Appearing in the *Encyclopedia of Criminology*, Branham, V. C. and Kutash, S. B. (editors) New York: Philosophical Library. 1949, 228-231.

Mental deficiency and feeblemindedness, used synonymously, are defined and contrasted with insanity. Classification of the feebleminded is described under three headings: (1) degree of defect, i. e., idiot, imbecile, moron; (2) clinical variety or symptom complex, e. g., mongolism, microcephaly; (3) etiology, viz., endogenous, exogenous, and mixed. The prevalence of mental deficiency is reported according to estimate in the general population, by proportion according to grade of defect, and by proportion according to etiological type. Examples of the relevance of mental deficiency in the field of jurisprudence are given. The relationship between mental deficiency and crime is discussed. Eight references.

R. H. CASSEL

CASSEL, ROBERT H., MENTAL DEFICIENCY AND PSYCHOSIS. *Journal of Clinical Psychology*, 1949, V, No. 2, pp 173-78

An evaluative history of the use of the diagnosis "Psychosis with Mental Deficiency" shows that the great semantic handicaps in the literature raise the question of how to diagnose psychosis on the basis of psychometric tests used with mentally deficient subjects. The history, test results, and behavioral observations in the case of a twenty-five year old boy at The Vineland Training School are presented. The history and psychometric picture indicated the presence of exogenous mental deficiency; but the behavioral observations indicated the presence of psychosis, which was later psychiatrically validated. The discussion ends with the conclusion that a complete history and a projective technique are necessary for an adequate diagnosis of sub-normal children.

H. D. ARBITMAN

CASSEL, ROBERT H., QUALITATIVE EVALUATION OF THE PROGRESSIVE MATRICES TESTS. *Educational and Psychological Measurement*, 1949, 9, No. 2, pp 233-41.

The Progressive Matrices Tests are described. Clinical experience with the tests, used with mental deficients, has formed the basis for the establishing of qualitative patterns of incorrect responses. These response patterns are discussed in relation to an experiment performed on thirty-three Vineland Training School subjects. The results show that the subjects could be divided into three groups on the basis of their incorrect responses: (1) those whose incorrect responses at no time classified under a qualitative pattern, (2) those whose incorrect responses followed a pattern and then deviated from it, and (3) those whose incorrect responses ultimately fell into a pattern. These groups are discussed in terms of maturational level, etiological differences, and the point at which a subject begins to guess at the correct answer. Further research on the PM Tests, employing a larger sample and controlling more variables might prove worthwhile.

H. D. ARBITMAN

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EDITORS' NOTE—The Bulletin is an experiment in co-operative journalism. Contributions are solicited from all who are interested in work for the defective and who have a successful method to report or an earnest criticism to make. It is expressly desired to give place to various shades of opinion.

Articles by the regular staff are initialed. For those and for unsigned articles, the editors are responsible. For signed articles the responsibility rests with the authors.